Successful Methods

CONSTRUCTION - ROAD MAKING - ENGINEERING - INDUSTRIAL - MINING

VOL. 1 DECEMBER 1919 No. 6

LAKEWOOD
BUILT TO LAST

A New Department of Lakewood to Help Solve Your Problems

It has always been the policy of Lakewood to recommend the use of plant that will best do the work and, at the same time, earn maximum profit for the user.

Frequently our engineers have suggested methods that required less equipment, thus decreasing the contractor's investment.

That this service is appreciated is evidenced by the large number of contractors who consider Lakewood as a part, at least, of their plant department.

To broaden this service and to make still easier the work of the contractor by developing new machinery that better meets the changing requirements of construction, Lakewood has created a new department, known as the

EXPANSION DEPARTMENT

This department includes a corps of experienced construction engineers who devote their entire time to the development of machinery that will increase the productive ability per man.

In this department new machines and improvements on others are created. Before being offered to the contracting field each machine is put to every conceivable test. When offered to you the equipment is as nearly perfect as it is possible to produce.

The work of this department is not confined to the Lakewood shops. Its representatives secure their ideas from actual contact with construction work. They combine data so secured with expert manufacturing knowledge, thus insuring as nearly perfect production as it is possible to attain.

THE LAKEWOOD ENGINEERING COMPANY
CLEVELAND, U. S. A.
Offices in all principal cities

EXPORT DEPARTMENT
ALMACO — ALLIED MACHINERY COMPANY OF AMERICA — ALMACO

Successful Methods

A Magazine of Construction Service

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WOOD
Lest We Forget.

Life is divided into two periods—the time for work and the time for play. And generally our ability to enjoy the play time is dependent upon how well we have spent our work time.

It has been the aim of Successful Methods to assist its readers in making the most of their work time, and the hope that it has been successful is closely bound up with our wishes to them for the fullest enjoyment of the holiday season now at hand.

This is the season of the year when men's minds dwell lovingly on old friends, the friends of years gone by, who too often have been all but forgotten in the rush of life. That is one reason why Successful Methods asks its readers at Christmas time to consider "wood."

For is not wood one of man's oldest friends, and more than that, a friend often forgotten of late? "This is the steel age," is one of the boasts of the present day and one is apt to forget the part that wood has played and still plays.

Lest we forget this old and still true friend of man, Successful Methods puts a picture of the Woods on its cover this Christmastide and on this page (itself made of wood pulp), admonishes its readers to consider "wood."

There is another reason, too: there was a certain carpenter shop in Nazareth some nineteen hundred years ago.

EDITORIALS

The Business of Production

AN ancient philosopher defined the beginning of wisdom as "being sensible to the disagreement of men with each other; an inquiry into the cause of the disagreement; and the discovery of some rule which shall serve like a balance, for the determination of weights; like a square, for distinguishing straight from crooked." Events of the past year have emphasized the rule that since the beginning of time has controlled the welfare and happiness of mankind—the rule of maximum production.

The reward of different classes of men may be out of proportion to the work they do, but certainly there can be no reward where nothing is produced.

Machines that increase the production of men are a vital factor in the business of production.

While the Cat's Away

IN its last two issues SUCCESSFUL METHODS has devoted considerable space to hints and suggestions for preparing machinery for winter storage. Such advice is for its readers and SUCCESSFUL METHODS hopes that many of them have taken advantage of it.

But merely to take the proper precautions when putting away the machinery in the fall is not enough. There is nothing so useful and comforting as an occasional visit of inspection to see that the machinery is where you left it, and as you left it.

At the bottom of the page is a cartoon which tells the story far better than it can be told in type. You were a boy yourself once, and remembering those days, you can't really blame the boys for the goings on in the animated and joyful scene on the right.

Just drop around now and then, give your machinery the once over and the comfort that comes from knowing that all is going well will be worth the extra steps taken and the time consumed.

Concerning Shovels

THE circle in the center of the opposite page is a study in extremes. The bucket of the big power shovel crushes its way through the earth and stone while so close behind it that he seems almost in danger of being crushed is a man clearing up with a hand shovel.

It is a contrast that always will exist. No matter how big and strong a power shovel may be, there always will be plenty of work left for the more humble hand shovel.

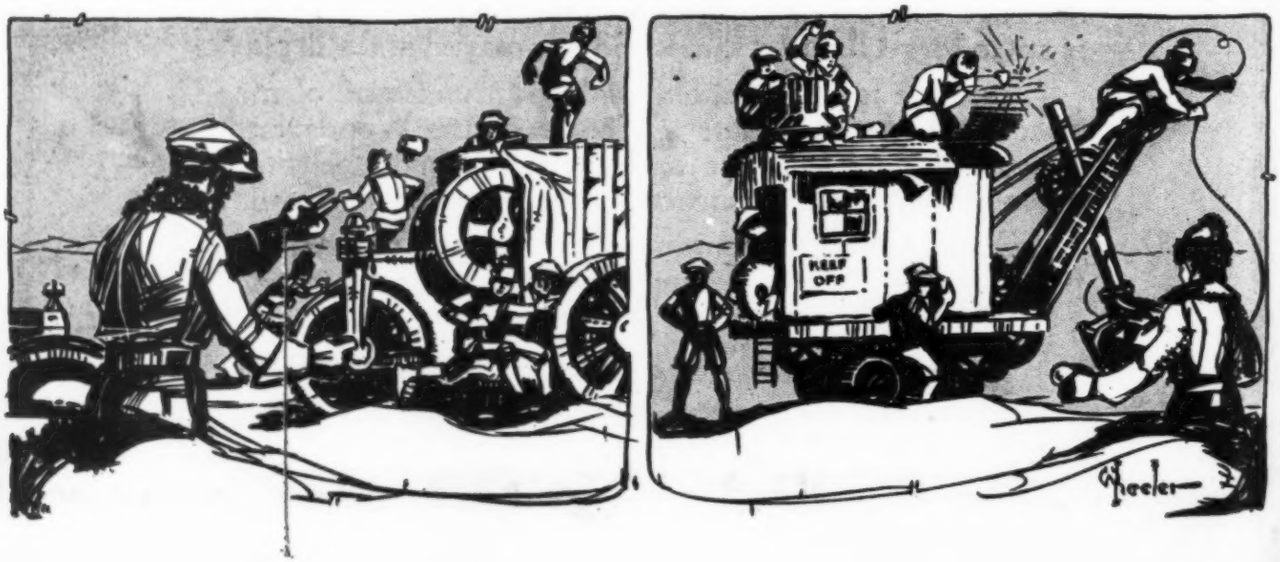
One is a machine just as much as the other. Each helps to increase the amount that man can produce. Big or little, a shovel is a shovel, one of the oldest tools known to man.

The Inspector Problem

ON another page of this issue of SUCCESSFUL METHODS will be found an article from one of our readers which discusses the inspector problem presented in the October issue.

Comment on that editorial has been received from readers from Maine to California and Mr. Ingham, whose suggestions for its solution are printed on page 12, is a Pacific Coast representative. What he says is well worth consideration. His nicely drawn distinction between "cheapness" and economy is a sermon in itself.

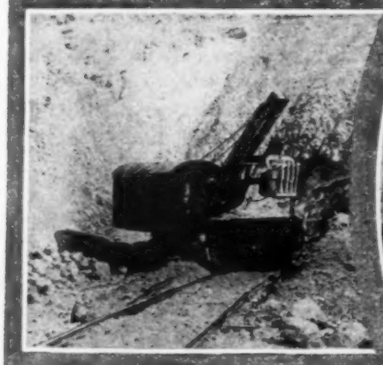
The problem is going to be solved one of these days and any other reader who has a suggestion for a remedy will find the columns of SUCCESSFUL METHODS open to him. Space in the January issue already has been taken by an eastern engineer, but there will be room for others in subsequent issues. There always will be room in this magazine for the opinions of its readers on important topics like this. That is one reason why SUCCESSFUL METHODS is published.



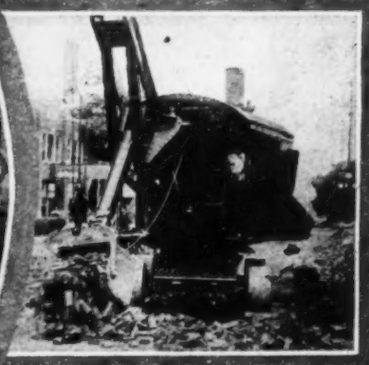
A Shovel for Every Job

An American Shovel That Is Doing Good Work for a Contractor in Madrid, Spain.

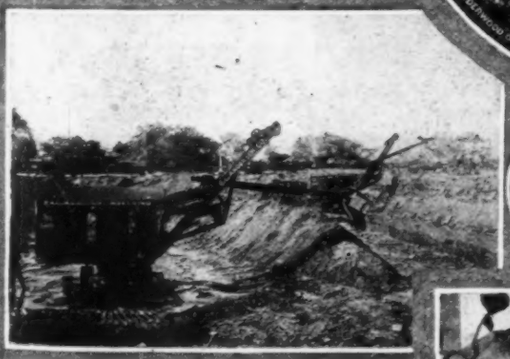
Side-Hill Casting High Up on the Slopes of the West Virginia Mountains.



Loading Cars in the Bottom of a Deep Gravel Pit.



Ripping Up Old Brick Pavement in a City Street.

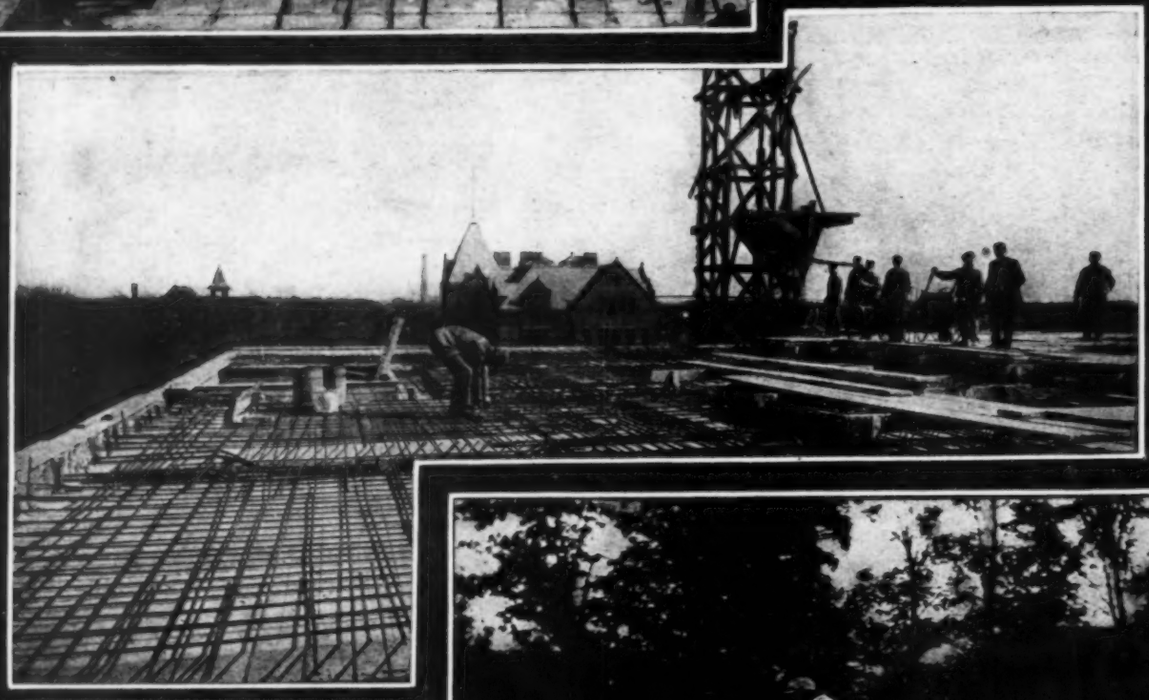


A Pair of Steam Shovels Excavating the Cellar of Chicago's Newest Hotel.

How a Shovel Loads a Wagon on Top of the Bank.

(At the left)—Shovel Moves Its Platform to a New Job.

Roofs and Roads



(Upper Left)—The Old-Fashioned Way. A Monk Working on a Monastery Roof. © Underwood & Underwood.

(Upper Right)—Saw Rig Helps Construction Work.

(Center)—A Big Roof Job.

(At the Right)—Wheelbarrows and Shovels on a Small Building.

Built by Machines

(Upper Left)—Road Work in Spring When Ground Is Soft.

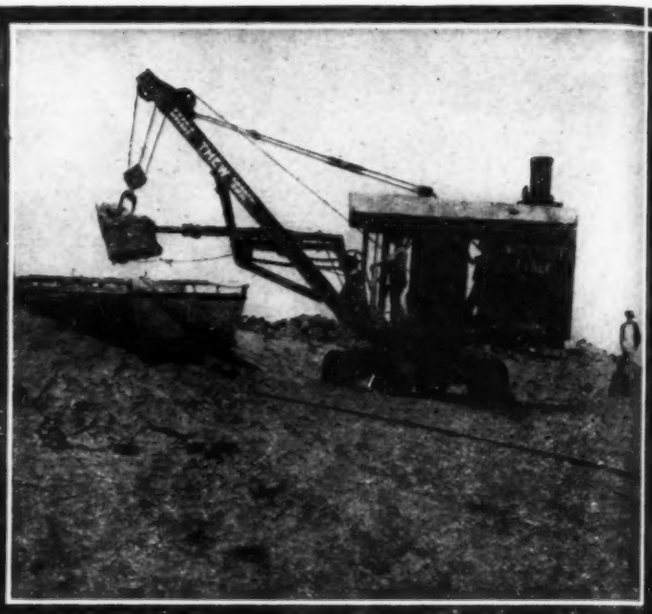
(Upper Right)—Girls Drafted for Road Work in Wisconsin.

(Center)—Tearing Up an Old Road Preparatory to Laying the New Surface.

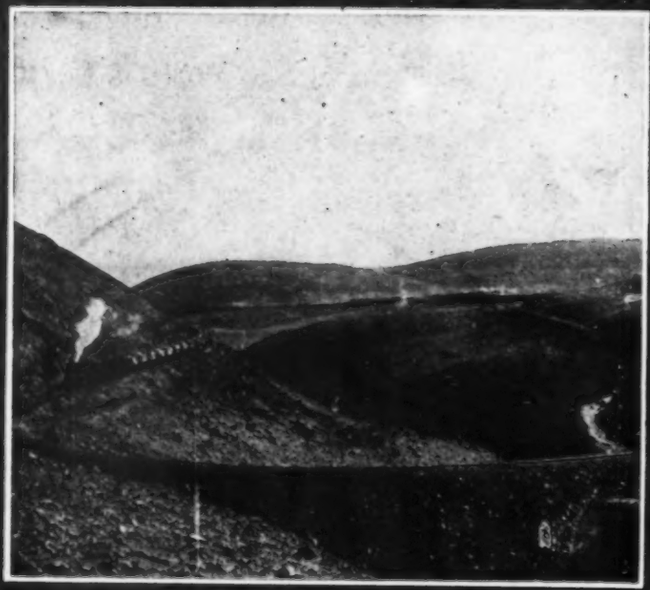
(At the Left)—Materials Brought to Concrete Mixer in Batch Boxes.

In Chilean Nitrate Fields

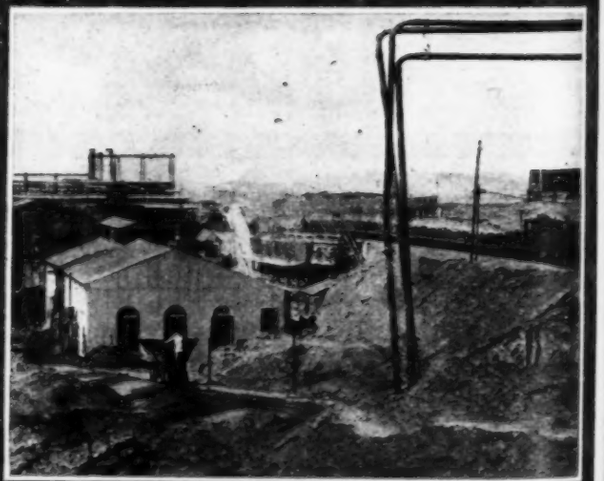
Hand method of loading "Acopias" or stock piles of ore separated from "Granzas" or tailings of worked over ground near Iquique, Chile. The discovery of a new method of separating the "Acopias" from the "Granzas" has resulted in a greatly increased production of nitrate.



Recently a steam shovel was installed and is demonstrating its efficiency by decreasing the cost of loading the "Granzas" and "Acopias." The success of the shovel in doing this work is illustrated by a cost of 14 ct. per ton as against 40 ct. per ton by hand.



Horseshoe Bend, traversed daily by long trains loaded with nitrate bearing ores on their way from the mines operated at Oficina Agua Santa in the Province of Tarapaca near Iquique, Chile. Millions of tons of this material are found at each Oficina.



General view of nitrate plant the property of Compania de Salitres y Ferrocarril de Aqua Santa, Iquique, Chile. The advent of steam shovel methods in the handling of the nitrate ores has made necessary an increase in the number of filters.

SOME SUGGESTIONS ON OIL

How, When and Where to Use It, and What It Really Does

By Charles C. Stedman

MANY ills are laid to poor oils, improper oiling systems, poor design for retaining oil, etc., that are not justified.

This statement is not made in defense of poor oil or insufficient oiling. But, before a journal can be properly lubricated it must be in proper shape to receive the lubricant, and therefore, the first thing necessary is to see to the journal.

Don't Wait For Squeak

The designer of the particular machine undoubtedly has designed the journal with a sufficient factor of safety so that there is considerable latitude before it shows distress, but the distress is there long before it gives outward signs, such as heating and knocking. The damage is done before the squeak makes itself heard.

For these reasons the condition of the journal should always be examined carefully after it shows signs of distress. Don't simply flood it with oil and after it has cooled off forget it, for that isn't curing the ills that caused the squeak and greater damage will follow almost inevitably.

One way to avoid trouble is to gain an insight into the construction of the machine with which you are dealing. A journal is designed to carry a load equally distributed along the entire length and the oil is the roller. (For that is what oil is, a bunch of small balls that form a filament between the shaft and the box.) If the box is parallel to the shaft this weight is equally distributed and the oil will not break down under the pressure, but should this journal be out of alignment it causes additional pressure at certain points, which the journal was not designed to carry, breaks down the filament of oil, and the bearing, coming in direct contact with the shaft, sets up a friction that heats up the journal.

Mere Oiling Won't Do

Such a condition will not be relieved by loosening the cap or by lubrication, and if allowed to run without correction, permanent damage to both box and pin will result, often making it necessary to stop operations at a most inconvenient time to make repairs that could have been avoided by a little attention to the alignment of the journal in the beginning. Just remember that whenever a bearing heats, squeaks or knocks, it is a warning which if not heeded multiplies in seriousness rapidly. No truer truism ever was said about a journal than "A stitch in time saves nine," and the contractor, superintendent or foreman who neglects to impress this upon his operators fails to stop one of his leaks. Simply because the machine has a rough exterior don't forget that it has a heart, and that is the journal.

Another defect that often occurs is a loose box which allows the shaft too much play. It pounds the box out of round, and makes it impossible to properly adjust the box thereafter. This also throws the box out of alignment, a condition which again throws excessive pressure on the oil filament, breaks down the oil and causes heating. Watch out for this sort of trouble.

From what has been said it is apparent that a bearing may run hot and not bind. Heating means simply that additional weight is thrown on some point of the bearing and not equally distributed along its entire length.

There is a commercial value in keeping a machine properly lubricated that is generally overlooked, and that is the resale value. Contractors often would like to exchange their equipment for something different and more suitable to the work then in progress, but owing to the condition of the machine, little or nothing can be allowed for it simply because of the failure to keep it properly lubricated and the journals adjusted.

A manufacturer recently remarked that he had seen a machine of his manufacture (a concrete mixer) that had been running for nine years and that it was running in first class condition and needed no overhauling. This is not an argument in favor of not keeping a machine properly overhauled, but illustrates what careful lubrication will do.

Get the Right Oil

Suitability of the oil for the job is another important factor. Where a gas engine is used in connection with a machine, it is necessary to have an oil on the job suitable for the engine. This oil should be selected to meet the engine conditions, and in addition the same oil will be suitable for lubricating other parts of the machine, where oil is preferable to hard grease.

Grease cups are desirable for lubricating journals that are exposed to weather or dust. The grease being forced out of the end of the bearing congeals on the end, forming a sealer that helps to protect the end of the bearing from the dust that might otherwise work in, and in case the journal starts to warm up the grease will become heated and run into the journal, thus furnishing additional lubrication that might otherwise be lacking at a critical time.

In selecting oil the important thing to be taken into consideration is viscosity (the adhesive quality) and the salesman who holds up a small vial of oil and lets it run from one end to the other, with the statement that you can tell by the looks that this is a good oil, is either a knave or a fool.

One Look Isn't Enough

Someone has said that the three greatest enigmas in this country are: Oil, Babbitt and Whiskey—please note that he put oil first on the list, for it is impossible to tell the viscosity of the oil by observation.

Therefore, oil and grease should be purchased from a reliable salesman or firm who is more interested in the service and results obtained from the use of the oil than in the profits from an individual order. And when it is bought, use it carefully, and don't forget to renew the supply before the machine begins to cry for more. By that time it will be too late.

SEPARATE CONTRACTS FOR GRADING AND PAVING
HOW SHOULD THEY BE AWARDED?

By Daniel J. Hauer,
Construction Economist

UNDER the caption, "Two Cooks or One?" A. N. Johnson in the September issue of Successful Methods opens up an interesting discussion of letting contracts for highway improvement. No one is better fitted than Mr. Johnson to speak for engineers upon any highway problem, but naturally he approaches the subject from an engineer's viewpoint and he gives a symposium from the leading highway engineers of the country, that must have entailed much labor to obtain. His deductions and recommendations are along good practice, but it seems well to present the contractor's viewpoint and to call attention to some of the inconsistencies that are to be found in the views of some of the engineers quoted, and especially in the construction specifications of a great number of state highway departments.

GRADING WITH TRACTORS

AND WITH HORSES

Mr. Johnson points out the need of attracting the well-established contractors to the highway field. This is advisable, but one evil in letting contracts should first be eliminated, namely, the small contract. One reason in the past for small contracts has been the desire to have some road improvements made in every village and district. As a result in nearly every county and state there are many short sections of improved roads fast going to pieces.

To build a mile of road a contractor must have some type of excavating machine, horses and wagons, a fleet of motor trucks, rollers, concrete mixers, levelers, drags, finishing machines, unloading apparatus, possibly crushers and sand and gravel washers, perhaps an asphalt plant, and many other tools and appliances. Without an ample modern plant he cannot hope to obtain contracts or do them economically. The same plant that may be employed for a few weeks or months on a short contract will build ten miles or more of road in a season. To put it in other words, a contract for $20,000 worth of road construction may require $30,000 worth of plant, although the value of the plant may not have to be increased more than ten or fifteen per cent to do a $250,000 contract.

Occasionally a short or small contract may be necessary, but with millions to expend and hundreds of miles to build, contracts should be of such size as to assure economical construction.

A contractor undertaking a large contract will wish to complete it both quickly and economically. In some cases this means placing his own forces and equipment upon the job and doing other parts by means of subcontractors. Immediately he is confronted by a provision of the specifications reading as follows:

"The contractor shall not sublet, sell, transfer, assign or otherwise dispose of the contract or any portion thereof or of the work provided for therein, to any person or corporation without the written consent of the State Highway Engineer."

This certainly is drastic, for such written consent is seldom obtained. Contrast this with a provision taken from a set of railroad specifications.

"Subletting of any part of the work under this contract can be done by and with the approval of the Chief Engineer."

They do not seem dissimilar, but one clause is meant to prevent subcontracting, the other to encourage it, as the writer has learned from experience.

One engineer wrote to Mr. Johnson, "What I believe would be productive of the best results would be to specify that the grading and drainage work could be sublet to other contractors and to encourage rather than discourage, as is done at present, the matter of subletting a portion of the work."

In spite of this opinion, this engineer's specification, revised only last year, contains a clause regarding subletting very similar to the one quoted. He has also inserted in his revised specifications this clause:

"At no time during the prosecution of the work shall more than four blocks or squares, or in open country more than one half mile of roadway, be under construction or obstructed to traffic without permission. The laying of the

surface course or pavement shall follow the completion of the base course as closely as may be required by the Engineer."

Another engineer limits the grading work to at least a quarter of a mile from laying of the pavement, while still another specifies that the subgrade must be finished for at least 200 feet ahead of the pavement, but does not limit the distance it can be carried ahead, yet the writer is told that the highway commission controls the situation by curtailing the monthly estimates on grading done a few thousand feet ahead of the pavement.

It is well enough for engineers to theorize and make suggestions and give their opinion as to successful methods, but practice is the essential, and one step ahead is to change contract forms and specifications so as to obtain economical results. Railroad companies and other private corporations have used and developed subcontracting to their own benefit, and it is time for our road engineers and commissions to learn from others.

The next step after increasing the size of the contract is to allow the successful contractor to use his discretion in subletting the work. This means that engineers must make their specifications modern and considerably more business-like than at present.

With these two things accomplished, contractors

LAYING THE PAVEMENT

themselves will solve the problems. Regrading and resurfacing jobs, when the excavation is slight, would no doubt be done by the paving contractor. To limit the amount of road that can be torn up at one time for this class of work is not unreasonable, but no limit should be set for new road work, cut offs, new alignments or heavy mountain roads.

Should engineers and road commissions desire to let the grading separately so as to have it done a season ahead of the paving, they can make the excavation and drainage one contract, to be followed later by a paving contract, or the entire work can be let at one time and the successful contractors either can sublet the grading, or, if they wish to do this part themselves, can sublet the paving.

Another method is to write bids on the combined work or on each class of work separately. As this is being written, a county in a southern state having $2,000,000 to expend, is inviting bids on grading and paving, on grading alone, on culverts and bridge work alone, and on paving alone. A request also is made for bids on a minimum of three miles of highway with the privilege of taking as many additional miles as a contractor feels he can handle. This method, brought forth by a desire to contract for the road construction under satisfactory prices and conditions, should attract bids at reasonable prices.

The solution of the problem is to let large contracts with the right to sublet. Then the contractor with strong financial backing and a large organization with ample equipment, will make use of the smaller contractor in whatever place he sees fit. He may let the grading to one subcontractor and to others the culverts and bridges and possibly some of the paving.

The answer in most cases would be "one cook" who would make bond, have ample capital, and through his own organization and that of his subcontractors would control large forces of skilled workmen and plenty of machinery. Even with half a dozen contractors, the management of the work would be under one man, which would avoid delays and the conflicts that may arise between different contractors on the same work.

Many contractors, who may not have cash to put up certified checks for bidding or who would have difficulty in obtaining bond for a large job and yet have sufficient capital and plant and possess the experience and skill to do first-class work, can be used by the general contractor as subs. With their own money and plant at stake they will do the work cheaper and better than it is likely to be done by a superintendent of the general contractor.

This method will make available large

CURING BY PONDING

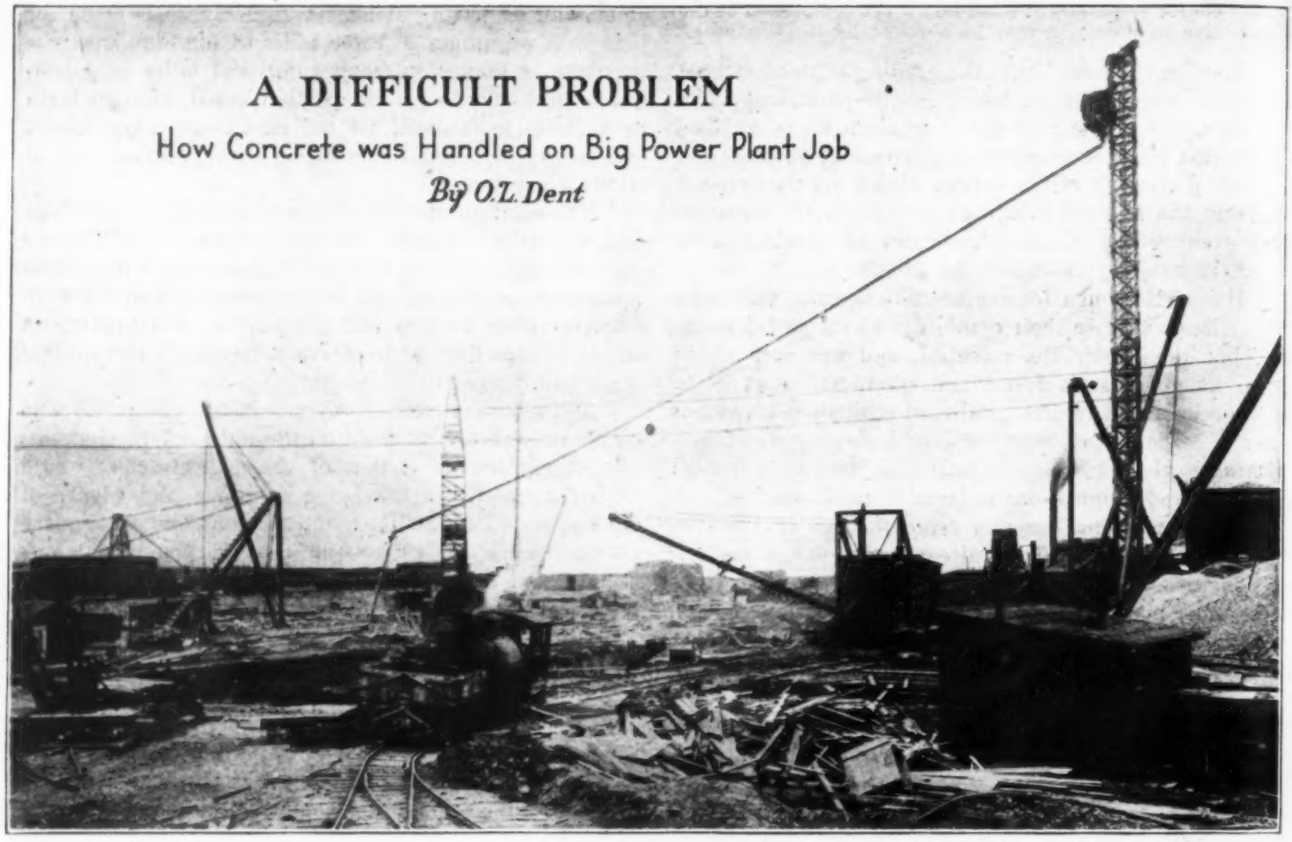
contracting organizations throughout the country, as well as hosts of local contractors, equipped to do grading, masonry, paving, clearing, fencing and other classes of construction.

The experience of the past in road building should not be the criterion for the present or future. Conditions have changed, the public voting vast sums and demanding that roads be built quickly and cheaply with this public money. Commissioners and engineers must understand these changed conditions and meet the problems. The methods of the past must go.

A DIFFICULT PROBLEM

How Concrete was Handled on Big Power Plant Job

By O.L. Dent



ONLY 18 months in which to place 60,000 cu. yds. of concrete, part of the construction work on the $7,000,000 power plant for the West Penn Railways at Springdale, Pa., was the problem which confronted Sanderson & Porter, contractors of New York, when they planned to begin work in the fall of 1918. Their schedule called for the completion of the building by the spring of 1920, which meant two winters and one summer of work, a none too convenient arrangement for concrete placing.

The new power plant is 220 ft. by 130 ft. and includes an intake from and an outlet into the Allegheny River. This is 260 ft. long, 60 ft. wide and 40 ft. deep. It was necessary to carry on the steel construction simultaneously with the concreting and as a result the placing of the concrete had to be done rapidly.

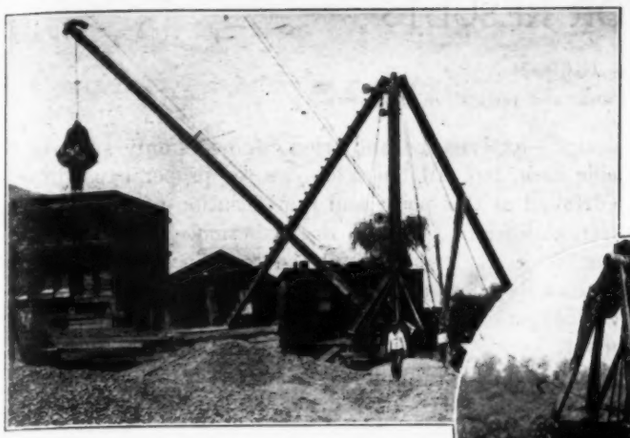
One of the chief features in producing speed was the use of a 90-ft. elephant trunk chute. Some extra work was necessary in coupling the sections of the chute together to withstand the strain caused by the unusual length, but no trouble whatever was experienced and the chute proved satisfactory. The longest line of flexible chute was used at a point on the chute line about midway between the tower and the end of the chute shown in the upper view. The line gate for this chute is barely discernible.

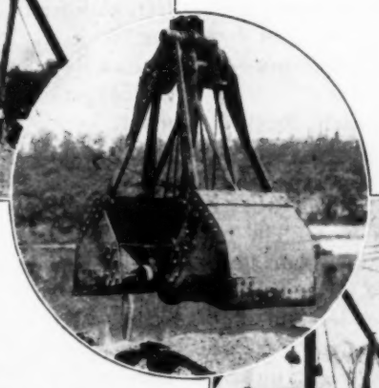
STEEL AND CONCRETE WORK WERE CARRIED ON SIMULTANEOUSLY

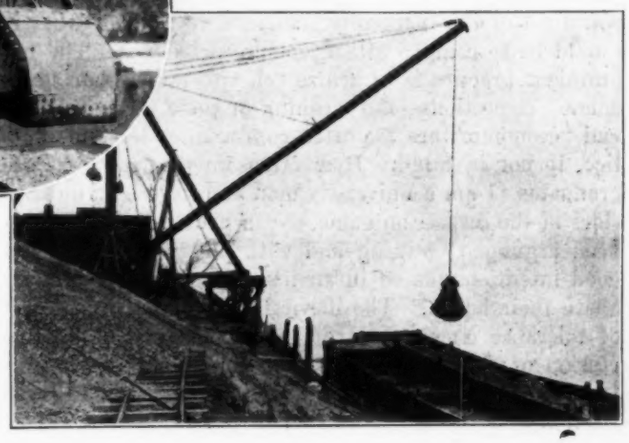
The concrete was mixed in a house with a cement storage of 15 cars capacity on the mixing room level. A bin holding 150 cu. yd. of sand and gravel was installed above, feeding into the mixer hopper by gravity. The gravel and sand were brought down to the work in barges, where they were unloaded by a stiff leg derrick with a 70-ft. beam and a ¾-yd. clamshell bucket.

A 1-cu. yd. mixer did the work, discharging the concrete directly into a 1-yd. bucket, which was elevated in a 125-ft. wooden tower to a 30-ft. hopper. From there it passed through a line chute 230 ft. long supported by a 1-in. cable attached to the top of the tower and a 60-ft guy tower. This chute line consists of two 50-ft. truss sections and three line gates. Later it was decided to drop this concrete through a flexible chute, so the 90-ft. line described above was installed. It consists of 4-ft. and 3-ft. flexible sections.

As the construction progressed and additional operations became necessary, it was decided to place an additional hopper on the tower 60 ft. from the ground and pour the intake and outlet along with the other construction work on the power plant. Two additional 50-ft. truss sections of chute were







supported by a gin pole and in addition the equipment was so adjusted that there was a direct dropping of concrete 75 ft. through the flexible chute. Both lines of chute were supplied from the same bucket by sliding the runner back and forth, letting the bucket alternate between the upper and the lower hopper, an easy and efficient method.

For head walls, small foundations and similar work a small mixer was used and it often poured as many as 80 cu. yd. of concrete in a day. The average day's pour of concrete on the whole job has been in excess of 400 cu. yd. and the cost of placing has been held as low as 68 ct. per cu. yd. Inspection of the chute after 40,000 cu. yd. had been placed through the chute showed that it was still in perfect condition.

The general view of the job at the bottom of the opposite page shows a large part of the steel structure erected and work progressing on the intake which appears in the lower right hand corner of the photograph.

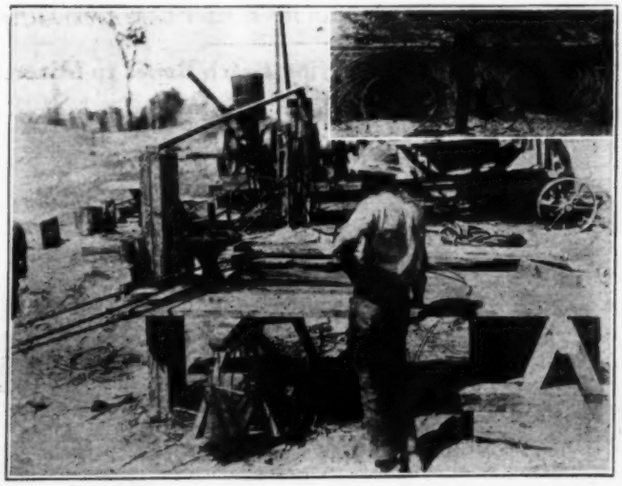
Springdale is a small town in Allegheny county, not far from Pittsburgh. W. E. Hamilton is the general superintendent and D. E. O'Brien is the assistant superintendent in charge of the job for Sanderson & Porter.

A NOVEL STEEL BENDER

By R. E. Herrick

A RECENT example of a good home-made job was encountered in the course of construction of a syphon under the Boise river near Caldwell, Idaho. This structure is 2,000 feet long and five feet inside diameter and is made from reinforced concrete. Square twisted bars 5/8-in. thick were used for reinforcement, and it was found that if these bars were all laid out end to end they would extend a distance of 37 miles. It was apparent that if the usual practice of bending these bars by means of hand power benders were adopted the costs would run sky high, but a little thought and ingenuity solved the problem.

The mixing for this job was to be done by means of a mixer mounted on a portable truck and connected up with a gasoline engine. This mixer is charged by means of a hoist and charging hopper, and by disconnecting the mixer the engine and hoist can be operated as a separate unit. This was done, and a grooved wooden pulley about two feet in diameter made up and bolted to the hoist drum. Then an ordinary wagon tire bender was set up on end and bolted to heavy uprights, thus making the rolls vertical instead of horizontal, as they are usually used. A grooved sheave was attached instead of the long handle and a manila rope drive rigged up to the grooved pulley on the hoist drum. A sliding idler pulley was rigged between the bender and hoist to give the proper tension on the rope. A rough work table was set at the right height, and it was ready to operate.



BENDING MACHINE AT WORK. THE FINISHED PRODUCT IN THE UPPER RIGHT HAND CORNER.

One man inserted the ends of the reinforcing bars between the rolls and steadied them by means of a heavy pair of blacksmith tongs. Two and three bars could be handled at one time, and as fast as one bar was bent it was removed by the helper. In this way from three to six bars could be bent per minute, and made the entire job of bending the 37 miles of steel but a matter of only about two days' time, thus effecting a saving of a considerable amount of money.

INSPECTION FOR RESULTS

By Edwin A. Ingham

Manager and Engineer, Madera Canal and Irrigation Company

IT IS an adequately proven economic principle that in any line of endeavor we must look past the first cost —why, then, does the construction world doggedly hang on to a disproved theory when it comes to inspection? Although we may hate to take the lesson, we must face the facts and look to the real purpose of inspection—we must get beyond this first cost stage.

The ultimate aim of inspection in construction work is to obtain the best structure possible commensurate with conditions. The average general practice, so far as the personnel of the inspectors goes, is a reversal of what it should be to comply with economic principles. The too prevalent practice is to utilize "cheap" rather than "economic" inspections—the meaning of these terms "cheap" and "economic" are too often confused, at least in practice, if not in mind. How often we see recent college graduates (I am a university man and have been on both sides of the inspection game, so am not advancing a sore-head argument) willing and with plenty of theory and good intentions placed in an inspecting position literally above their heads? The inevitable consequence is a sort of tolerance on the part of the contractors and a preclusion of the necessary co-operation to produce results from the very start. "Cheap" inspection is apt to mean friction and "cheap" work in the end.

The need is for mutual co-operation and an exercise of common sense and judgment that will work towards results which will be satisfactory to contractor, inspector and owner alike—and to assure these desired results we must forget the present false economy in regard to inspectors and employ men of more mature experience, judgment and diplomacy. This necessarily will raise the first cost of inspection, but will result in a small ultimate cost in proportion to the product obtained.

Proper selection of inspectors should eliminate those too young in experience to have adequate judgment, or those too old to adjust themselves to the new, yet tried, practices. Such procedure should not throw good men out of employment, for there is always some place for everyone who is industrious and who can and will give a service. No pains nor expense are spared on plans and design—experienced and tried engineers only are acceptable here, but, all too often, we see proper expenditures curtailed at this point and the execution of costly design left, at least in a degree, to inexperience with the almost inevitable result of a structure or work below par. A plan, reasonably above criticism in itself, is thus made the toy of inexperience rather than a truly constructive instrument, as was the original intention. The old proverb, "An ounce of prevention is worth a pound of cure," applies "mightily" all the way through a piece of construction work!

However, it must be clearly realized that the inspector alone cannot be held accountable for the success or failure in the execution of a construction contract—he is too often made the goat! First of all, the specifications must be adaptable to the work in hand. Instructions to the inspector are too often inadequate and not conducive to best results—he is too frequently tied down to machine-like duty with little opportunity for constructive flexibility of interpretation.

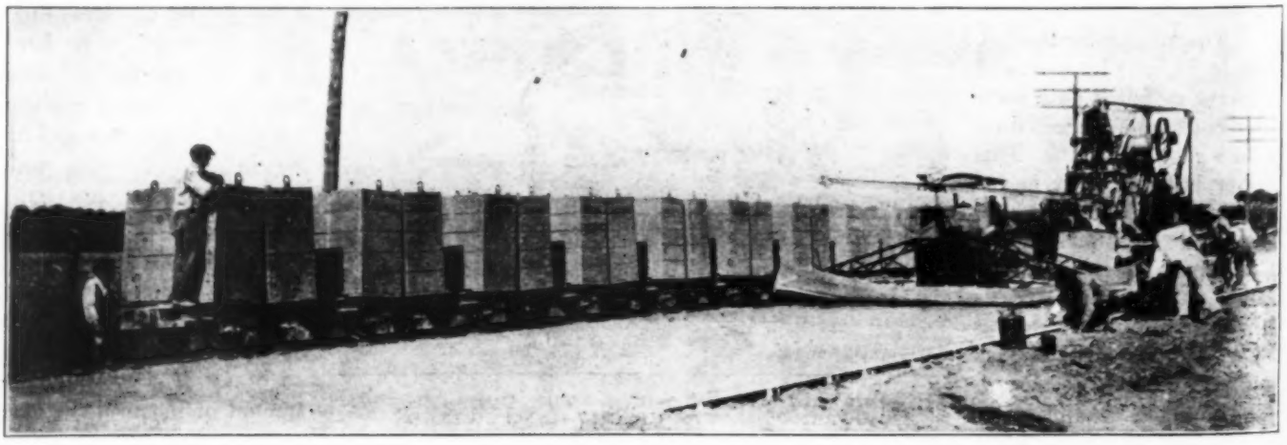
His eye is held so close to the letter of the specification that he cannot see through to the result desired. Then, too, there must be co-operative effort on the part of the contractor and his organization—no amount of effort on the part of an inspector will avail unless he can induce collective and co-ordinated endeavor, with an exercise of mutual patience. Both inspector and contractor must, at times, look at the job from the other fellow's viewpoint.

First, then, we must strive to write "sensible" specifications, and second, to make a careful selection of inspectors, subordinating the first cost idea, if we are to expect co-operative effort on the part of the contractor which will result in the class of construction to be desired.

We expect common sense on the part of inspector and contractor alike—what degree of common sense and executive ability do we display in our selection of inspectors and in instructions to them? Are the specifications we write practical and workable? We plan and design with results in view—do we look, as we should, clear through the inspection problem to those results?

(Editor's Note: The editorial on the inspection problem in the October issue brought forth this article from a reader.)

Industrial Railway Carrying Batch Boxes to Mixer



MIXER TO SEWER DIRECT

Concreting Sewer from Top of Spoil Bank

IN rebuilding an 11-ft. brick sewer for the city of Cincinnati, O., the contractor expedited the work by placing the mixer on the spoil bank and spouting the concrete directly into the sewer forms.

The contract covered 995 ft. of work, 270 ft. of which were in tunnel. The specifications called for the top

GRAVITY DOES ITS BIT.

to be taken off the old brick sewer to the spring line and the construction of a box top of concrete on the old bed, so as to make a 17-ft. sewer.

The bottom of the old sewer had to be raised several feet, which necessitated the construction of coffer dams and flumes, one of which is shown in the lower center of the illustration. After taking the sediment out of the old sewer the new concrete bottom was placed directly on the old brick floor.

A steam shovel was used in excavating the soil above the old sewer and the dirt taken out was all piled up on the north side to give an elevation high enough for spouting the concrete down directly into the forms by the gravity system. As the mixer was easily moved along to keep abreast with the job, there was no expense of constructing runways for wheeling the concrete to the forms. The illustration shows how the discharge chute of the paver was coupled up to the spouting system. J. J. Foley of Cincinnati, Ohio, was the contractor.

CUTTING OFF CONCRETE PILES

A successful method of cutting off reinforced concrete piles was described by Kirby Smith in *Public Works in the Navy*. The piles were 18 in. square at the butt and reinforced with eight ¾-in. rods and ⅜-in. wire hoops spaced 8 in.

Outside the reinforcing rods there was a protective concrete covering of 2 to 2½ in. This was chipped off at the required level with a bull chisel and a sledge, leaving the rods exposed. An air drill was tried, but the chisel and sledge method was found to be easier. Then the rods were cut with an acetylene torch. This left the concrete core, which had a low tensile strength.

Where the projecting pile was of sufficient length to give good leverage, a 1½-in. manila rope was slung around the top of the pile and 4 men pulling on the rope snapped the pile off at the cut. Where the projecting portion was short, the same result was accomplished by a direct pull from the stationary engine on a ⅞-in. steel cable attached to the top of the pile.

Two men were employed in cutting out the concrete and 4 men to snap off the piles. The average time for each pile was 1 hr. and the total cost per pile averaged 60 ct.

SETTING METERS TO PREVENT FREEZING

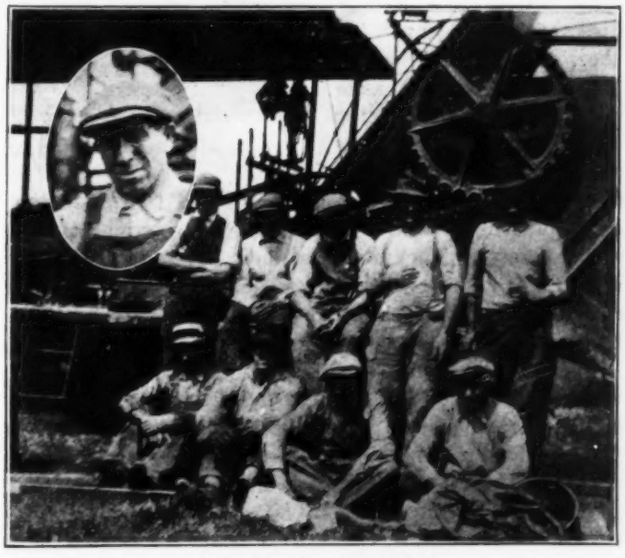
The meter may be set in a tight box so that the bottom of the box or pipe is well below the frost line. The warm earth then will act as a radiator. As a simple expedient, sink a hole below the bottom of the box with a post hole auger and drop in two or three lengths of tile.

VICTOR TEETARD

"WALKER, you attend to the business end and I'll keep the work going," said Victor Teetard to his partner, Lee Walker, the other member of the Walker-Teetard Co., sewer contractors of Detroit, Mich. "You can wear good clothes and get the clients, but I'll run the job." This is their successful method.

This is the way the Walker-Teetard firm operates and as a result, it is digging sewer trenches and laying sewers at a rate that would make your hair stand on end.

Victor Teetard has been laying sewers for many years. He worked on the Grosse Pointe sewers which were tunnel work and laid many miles of open trench sewers. At the present time the Walker-Teetard Co. does about $150,000 worth of business each year. The mem-



TEETARD AND HIS CREW.

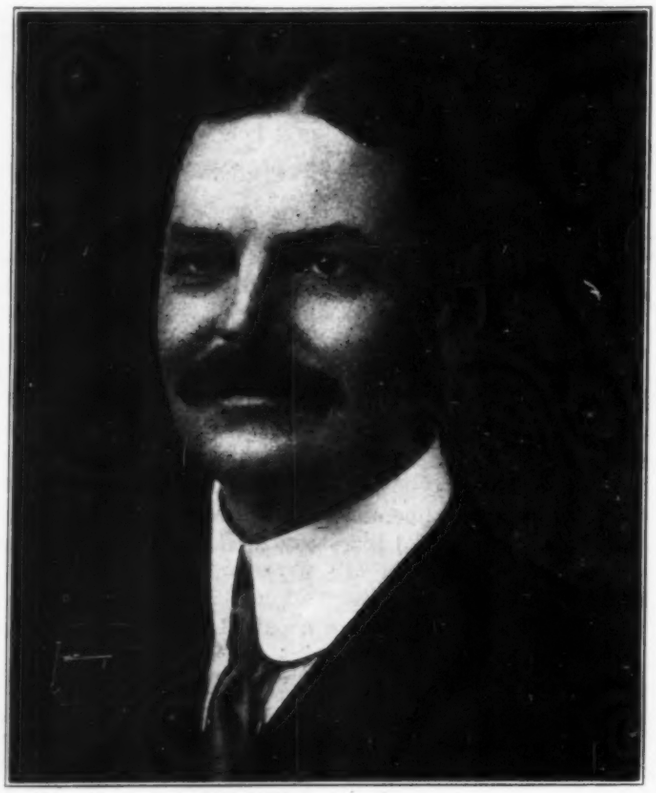
bers of the firm believe in using machines that increase the work of men and getting steady men to operate them.

Teetard does not believe in foremen. He'd rather be the foreman himself, he says. And if anybody can get better results than he does, let him step forward and hold up his right hand. Teetard has a foreman who won't quit and his machines and their crews work together.

LEONARD C. WASON, OF ABERTHAW

Team Work the Keynote in Success of Big Boston Contractors

IF one were to ask Leonard C. Wason, President of the Aberthaw Construction Company of Boston, how he had brought about the success of his company, he would modestly sidestep. First, he would maintain that not he, but the *team work* of the whole group constituting the company should be credited with the concern's success. As for methods—yes, there had been a policy back of the team work constituting its real impelling force—the policy of personal honesty carried into corporate relationships.



LEONARD C. WASON

In part Mr. Wason is right: team work and honesty have made Aberthaw a highly successful company. But there could not be much team work until there was a fair sized team: and in the company's early days, twenty-six years ago, Mr. Wason was a good many parts of the whole show. He inculcated then the belief that honesty is the best policy and he spent more than ten years of the hardest and most gruelling struggle to prove it true.

In that day concrete construction was a new discovery, very much in the experimental stage. Mr. Wason and his associates, fresh from the technical school, saw its possibilities and undertook to develop them. In New England they were concrete pioneers. Their beginnings were humble: their aim was lofty. They made up their minds that each job undertaken should have as its standard of work, not *good enough*, but *perfection*: as its standard of dealing not the honesty of the meticulous contract, but of the square deal.

They passed these conceptions on to their employees, who, when they found them to be actual working principles, learned quickly to respect the company, their own work and themselves, in the accomplishing of it. They could meet each other and their superiors on the common ground of striving for the best. Under such circumstances team work was bound to develop. It could not help itself.

Such team work has succeeded. At the end of its first ten years of existence, however, Aberthaw was poorer in cash than at the beginning. The hazards of estimating in a new material, like concrete, had been great—the protective margin small. No matter what the money cost, the company had met its contractual requirements in full. Specifications had not been scamped, substitutions had not been allowed, and inferior workmanship was not permitted to stand uncorrected because unobserved. The company's capital was worn to the point of complete evaporation—when the tide turned.

Clients began employing Aberthaw even when the company's estimates ran high among competitive bidders. They continued to employ Aberthaw when the Company ceased to offer competitive bids and contented itself with undertaking work only on the basis of cost plus a fixed fee. That is the whole story. With a reputation well established and clientele firmly attached to it, the Aberthaw Construction Company has expanded normally during recent years until it counts its annual contracts in terms of millions of dollars.

The Aberthaw Company now has in press an anniversary volume celebrating its first quarter century that closed with the end of last year. The book outlines the story of the company's philosophy and of its material development. The philosophy was big enough at the start to last through unchanged. The material development began with concrete sidewalks. From there it has progressed through the whole range of industrial building: factories, warehouses, power-plants, mills, water powers and such vast marine constructions as the Squantum Destroyer Plant of the Bethlehem Shipbuilding Corporation.

It is pretty clear that with the honesty and team work has gone a far reaching engineering knowledge. These qualities coupled with a business grasp inclusive enough to solve the complexities, not only of a plan of operations, but of the purchase, employment and transportation that must be carried into effect with it, have achieved the success they deserved.

Mr. Wason could not have accomplished all this alone. Growth implies the addition of men, the creation of an organization that can stretch to encompass increased responsibilities. But the direction and quality of growth depends largely upon the germ from which it starts. That Mr. Wason provided.

His, too, was the determination that clung to fundamental right principles, even when they seemed to be failing in operation, and that finally justified them by complete success. For these things Mr. Wason deserves much more credit than he is ever likely to claim, or to accept, even when thrust upon him.

KEEPING ACCURATE ACCOUNTS IS ONE WAY TO MAKE MONEY

Knowledge of Fundamentals of Business Is Important Factor—Uniform System for Contractors Advocated

THE theory that any accountant can step in, take charge of your books for a short while and then tell you more about your own business than you know yourself, does not sound reasonable to Tom P. McGrath, of the McGrath Land and Gravel Co., of Lincoln, Ill. He argues that an accountant ought to specialize in one particular business in order to be thoroughly efficient in that business, because a careful study of the peculiar conditions surrounding the business is a matter of necessity.

Just to show that he practices what he preaches, Mr. McGrath gives a number of accounting hints for a sand and gravel business. Here they are:

Liability Insurance.—Present statement to your insurance agent of losses sustained during the years of operation, and if losses are low and the rate is high, keep on the subject until after an experience rating is given.

Fire Insurance.—The same thing applies here. If all the operators have this matter up, we will have more success in getting a reduction in rates.

New Accounting.—Immediately upon the opening of a new account, get a rating and preserve it.

Collections.—Use a good follow-up system. Be able to write a good letter and not one of the rubber stamp kind. A good letter is short and direct, diplomatic and at the same time, convincing.

Bookkeeping.—Trial balance system, statements of assets and liabilities, and trading profit and loss, as often as necessary to keep in touch with the condition of the company, at least once a month.

Operating.—Watch the daily tonnage report. If not up to the standard, notify the manager of operations, and then it is up to him to correct the fault.

Banking.—Watch your bank account and never overdraw. It is a bad habit and destroys credit.

Stripping.—The cost of stripping or overburden, should be placed in Miscellaneous Assets, and monthly charges made against this account in accordance with the amount of stripped surface consumed.

Bad Accounts.—When every means to collect an account has failed, charge it off. Then if later on the account is collected, apply it to the earnings of the current year.

Taxes.—The accountant should familiarize himself with the normal income, excess and war profit tax exemptions, allowances and deductions as they affect his own line of business.

Depreciation.—The rate of depreciation should be arrived at in the same way as an experience insurance rate is figured, namely, if the average life of your plants in the past has been 10 years, the depreciation should be charged at 10% of the original cost. A replacement reserve account should be opened and credited with the amount charged to depreciation. If the replacement reserve becomes equal to the original cost of the plant no further charge.

Obsolescence.—In case the plant becomes obsolete before the replacement reserve has become equal to the original cost of the plant, the difference between the replacement reserve and the original cost, minus the salvage value, should be charged to obsolescence.

If you are operating a plant whose normal life is 10 years, on property on which you have a lease for only 5 years, without privilege of extension, then a yearly charge of 10% for depreciation and an additional 10% for obsolescence, making a 20% charge against the original cost, should be made.

Repairs and Supplies.—When repairs and supplies are bought to maintain the plant in operation, they should be charged against expense, and not entered under assets which would show an increased valuation of your plant.

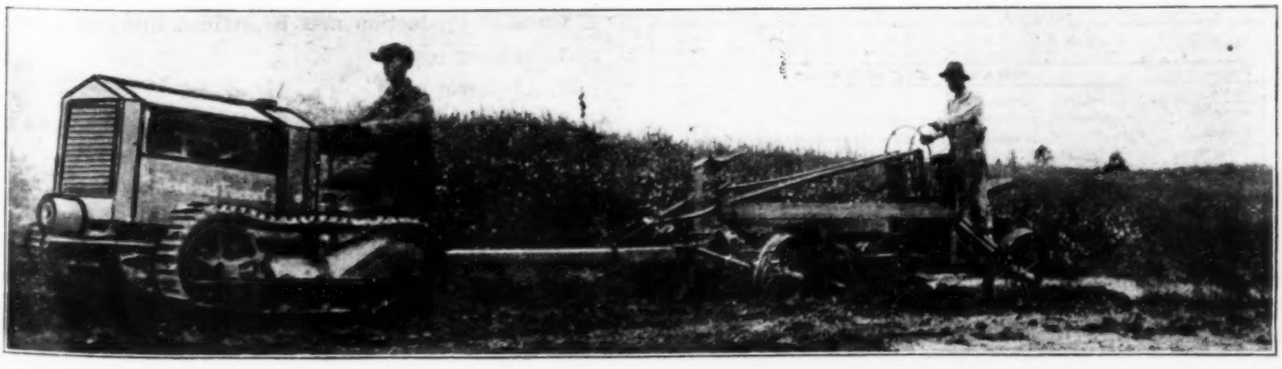
Depletion.—The depletion charge allowed by the Government in computing taxes, is based upon the cost of the gravel property, plus the cost of that part of the property that the plant, equipment and switch tracks occupy, from under which the sand and gravel cannot be excavated.

L. A. Weatherwax, of Henrickson & Co., Inc., contractors, of Seattle, Wash., makes a plea for standardization of accounting methods among contractors. He begins his argument by recalling the all too familiar situation at the opening of bids for almost any piece of construction work. Almost without exception, the bids are so varied because of the different methods of accounting used by the bidders, that those in charge of awarding the work are inclined to grow suspicious of each and every bidder, and of contractors as a class.

It ought not to be hard to devise a uniform system, because the great majority of contractors are operating on an invested capital of not more than $100,000. Furthermore, unless the contractors devise such a system themselves, the Government probably will step in and do it for them.

The periodical collections for state industrial insurance, medical aid funds, etc., make it necessary that the contractor should know just where he stands. The frequent inquiries from Dun and Bradstreet for credit data, and last but not least, the things that the banks want to know and have a right to know when the contractor goes to them to borrow money, all emphasize the necessity for a uniform system of accounting. It is bound to come some time, and the contractor undoubtedly could hasten its coming if he would start the ball rolling without delay.

Small Tractor Hauling Road Machine

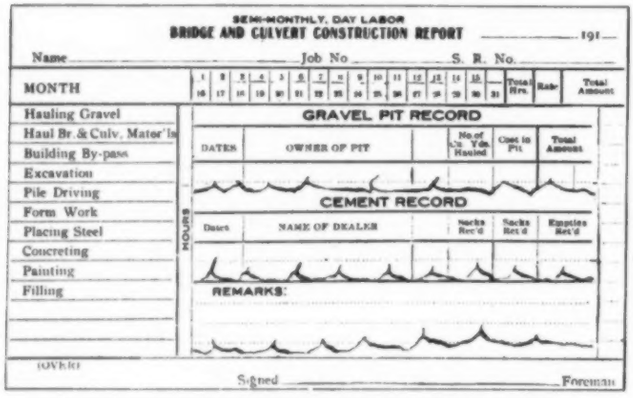


PAYING THE CONTRACTOR

How to Record and File Data from Which Monthly Estimates Are Prepared

By J. A. PRIOR
County Highway Engineer, Red Wing, Minn.

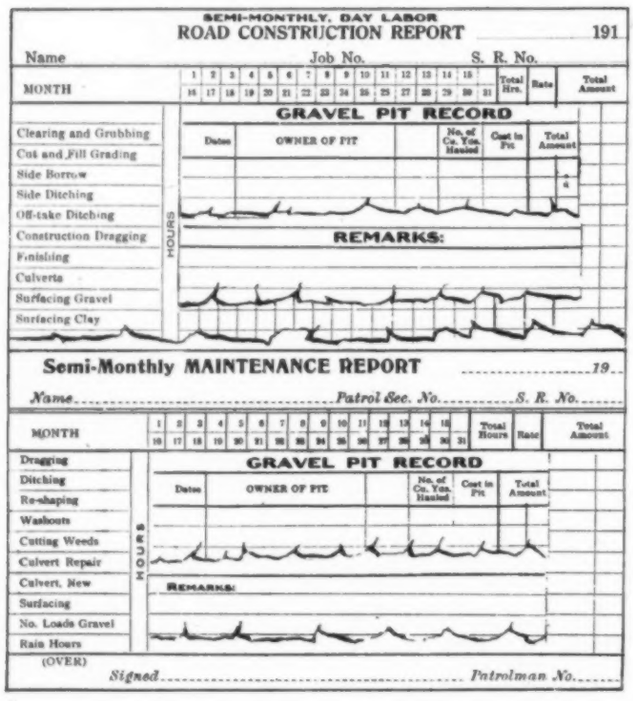
A SYSTEM for keeping track of the quantities used in making the monthly payments to contractors is well worth while. Unfortunately there frequently arises some difference of opinion as to the quantities involved. When this takes place it is necessary for the engineer to



FOR FINDING BRIDGE AND CULVERT COSTS

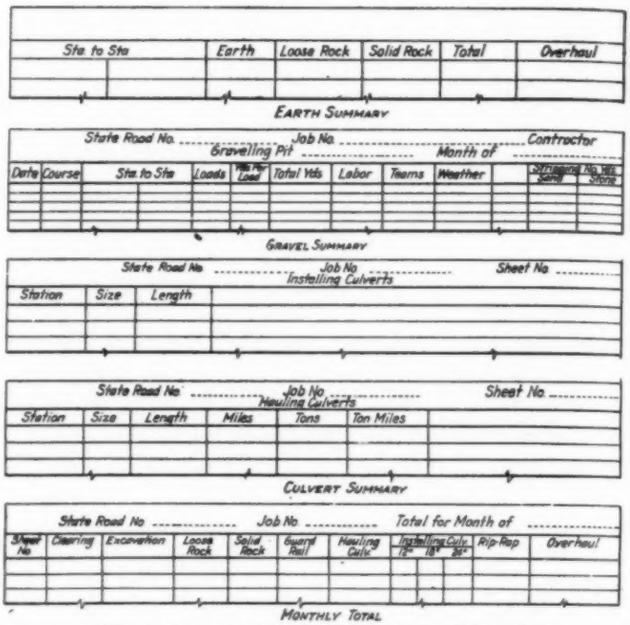
recompute all quantities, and since in many cases the records from which the estimate is taken are either destroyed or have not been systematically kept, it is necessary to make an entirely new estimate. To meet this difficulty I am now using the system here described.

Each month I inspect the job and determine the stations between which work has been done, the amount of work accomplished and obtain any other information necessary for the preparation of the estimate. Quantities



TO FIND CONSTRUCTION AND MAINTENANCE COSTS

are then taken from the profiles and cross-sections in the ordinary way. This information is permanently recorded on 5 by 8 in. cards ruled as shown in the illustration and kept in a cardboard filing case. The sheet number of



RECORD CARDS FOR WORK ACCOMPLISHED

the plans from which the estimate for the month is made is invariably recorded. In some cases there is a card for each sheet.

From these cards can be determined the information used in making up an estimate for any month no matter how far back it may be. When a card is filled a new one is made out and filed with the old one.

DEFINING COST

The following are five broad definitions of cost terms:

Cost of production includes money outlays, debits incurred, proprietary losses of normal income and compensation for risks involved in production.

Cost may be divided into two classes of business debits:

1. Debits of the business to others than the proprietor.
2. Debits of the business to the proprietor.

In well kept ledgers all the first-named class of costs will be found, either as property costs or as operating expenses, but it frequently happens that not all—and sometimes not any—of the second class of costs is entered in the ledgers.

Costs of production may be divided into two parts:

1. Direct costs.
2. Indirect costs.

Direct costs are those costs directly assignable to a group of similar units of product without pro-rating.

Indirect costs are costs that cannot be directly assigned to a group of similar units, but must be pro-rated among different groups of units.

Unit cost is the cost per unit of product, and is determined by dividing the total cost assigned to a group of units of product by the total number of units.

A unit cost includes all the direct costs and it may include all or nearly all the indirect costs, depending upon the method of accounting or cost analysis.

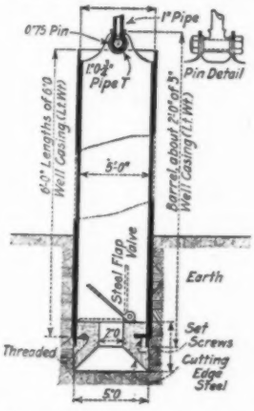
In appraisal work, as well as in estimating the cost of projected work, it is customary for engineers to use unit costs that include only part of the indirect cost, the remainder of the indirect cost being called "overhead cost."

Overhead cost is that part of the indirect cost not included in the unit costs.

No hard and fast line can be drawn between unit cost and overhead cost. It is entirely a matter of more or less arbitrary definition. If a company does its construction work by contract, the contractor's *unit prices* are the company's unit costs; but the contractor's unit prices include all of *his* overhead costs. Hence, if a company does its construction with its own forces, its overhead costs will ordinarily be greater than if it does its work by contract, due to the differences in accounting.

USEFUL SOIL SAMPLING TOOL

The accompanying sketch shows an arrangement devised for obtaining bore samples. The device consists of an outer section, composed of 6-in. light weight well casing, which is forced down by a weighted platform.



The inner section is made of 5-in. light weight well casing and carries the cutter. The two sizes of casing rest snugly, but not tightly, so that the barrel moves freely within the outer case.

The arrangement was designed by R. R. Ryan and was first used in 1909 in bringing up samples of the soil at the site of Florence Bridge, Florence, Ariz. The tool is simple in design and has proved very efficient.

PORTABLE AIR HOISTS OPERATE DISABLED DERRICK

A method of using two small tugger portable air hoists in the operation of a large quarry derrick at a Montpelier, Vt., quarry, was described by H. L. Hicks in the *Compressed Air Magazine*. While the regular swinging engine was being repaired, the two hoists were bolted side by side to 2-in. planks, which in turn were chained to two large blocks of granite. The lines from the hoists were led to opposite sides of the bullwheel, one being used to swing the derrick in one direction and the other to swing it back.

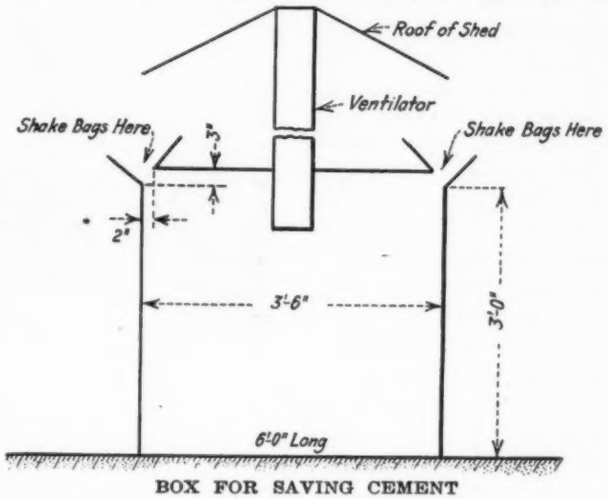
This improvised arrangement kept the derrick in operation more than a week while the swinging engine was being repaired. In ordinary service one of the hoists is employed to overhaul the heavy cable from one of the derricks across the quarry pit, while the other is used in lowering steel and light loads into the pits.

CLEANING CEMENT SACKS

Closed Box With Ventilator Eliminates Dust and Saves More Cement

A DEVICE for cleaning cement sacks without dust, and saving more cement is used by John Owens, foreman of a concrete mixing plant of the Miami Conservancy District near Dayton, Ohio.

The box shown in the figure is 3½ ft. by 6½ ft. by 3 ft. deep, with an air shaft running through the roof



BOX FOR SAVING CEMENT

of the shed. The sides of the box beginning 3 in. from the top flare at an agle of 45°. The width of the lid allows a 2 in. opening. The empty sack is dropped mouth down through this 2 in. slot and shaken. The circulation of air downward through the slot and upward through the ventilator prevents the dust from rising through the slot.

It was found that with this device the speed of cleaning sacks was doubled and fully twice as much cement reclaimed as when sacks are shaken in an open box. Eleven full sacks of cement were saved in cleaning 1,500 sacks.

HANDLING FACE BRICK

Brick when shipped from the factory are loaded in straw and are packed tightly in the car. In most cases, of course, except in the larger cities, the contractor buys f. o. b. car at destination, and has the bricks drayed.

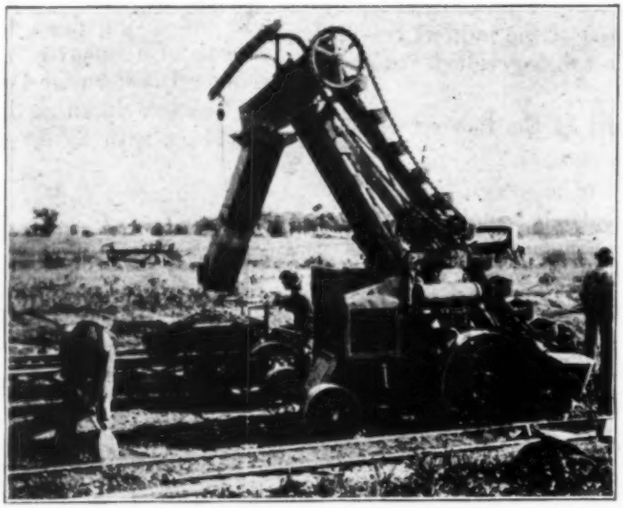
He should caution his draymen to keep at least a good portion of the straw with the brick when he takes same from the car, and he must have his teamsters pack bricks tightly in wagons. Upon arrival at the building site bricks should be placed on boards lying about 4 in. above the sidewalk or street so that the dirty rain water will not disfigure the bottom of the pile. This simple precaution frequently is overlooked, as is also the important requirement that pressed brick, particularly light shades, either should be stored under a shed or covered with tarpaulin.

These simple precautions will eliminate considerable of the necessity for extreme cleaning down after the bricks are laid in the wall. In cleaning down our experience has been that the best solution is a mixture of muriatic acid and water, using one part acid and six parts water.

MODERN HIGHWAY BUILDING IN MINNESOTA

By J. B. Woodbury

TWO successful road plants, nearly identical, are being operated on different sections of the Jefferson Highway in Minnesota by the General Contracting Company of Minneapolis. One outfit is at work near St. Cloud and the other near the village of Osseo, about 20 miles from Minneapolis. The Jefferson Highway is the big North and South route which ultimately will connect Winnipeg and New Orleans. These two plants are so designed that as much of the work as possible is handled mechanically. All of the stone is handled by machinery and stone constitutes two-thirds of the material which makes up pavements.



BUCKET LOADER IN ACTION

The pavement is 15 ft. wide with a 5-in. base covered with a 2-in. surface of bitulithic type. The mix is 1:2:6 and at first the capacity of the plant was about 1,800 sq. yd., but changes in the specifications for the mix reduced the quantity to about 800 sq. yd. per day, which means about 500 lineal feet. Six miles have been built this year with the plant.

When first operated, the mechanical loader shown in the photographs was not a part of the plant, but since its purchase 4 men have been eliminated and at present 20 men are all that are needed on the entire job. The plant consists of a self-feeding bucket loader, conveyor, a mixer and paver, and tamping and finishing machine. The 20 men are working as follows:

1 loader operator	3 paver operators
4 sand shovelers	2 men on finishing machine
2 conveyor operators	3 men laying forms
1 cement handler	4 extras

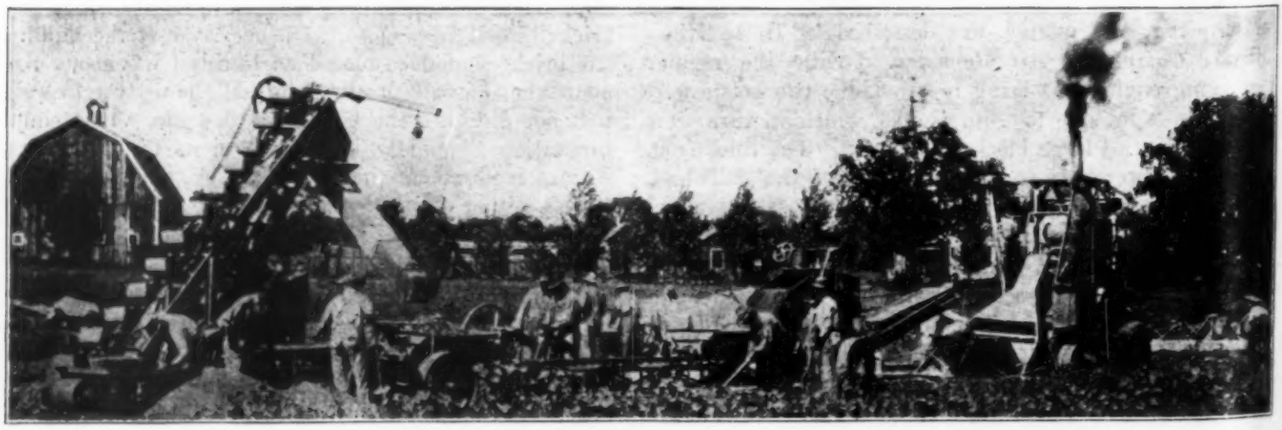
The total of 20 men does not, of course, include the men who operate the trucks which haul the material to the job.

The sand and stone are delivered in 5-ton trucks and dumped in windrows. The cement in sacks is piled at the side, to be used as needed. After a little experimenting a method was worked out so that this piling could be done in such a way that the subgrade could be kept clean as the work progressed and yet at the same time an adequate supply would always be available. The working space is limited by the length of the conveyor, but is flexible enough to allow for slight errors in spacing the loads to be dumped in windrows by the trucks.

The loader picks the material off the subgrade by means of revolving discs and discharges it into measuring hoppers provided for the sand and stone. These are mounted on rollers which move along the frame of the conveyor, enabling the men to shovel the sand or load the stone at any point along the 40 feet of its length. The hoppers also are adjustable to provide for different mixes. When they are filled by the bucket loader and the men, they are tripped, the material falling on the belt of the conveyor, which carries it directly to the skip of the mixer.

The skip is lowered to receive the aggregate thrown into it by the conveyor belt and at the same time the cement is added from the sacks by hand. The conveyor then stops while the skip is raised to transfer the batch to the mixer. The skip then is lowered again and the operation is repeated, the measuring hoppers having been refilled in the meantime. The tamping and finishing machine then completes the job.

It was found that it is possible to keep the paver working all the time, but the loader is not in continuous operation as it and the men shoveling sand work a little faster than the mixer.



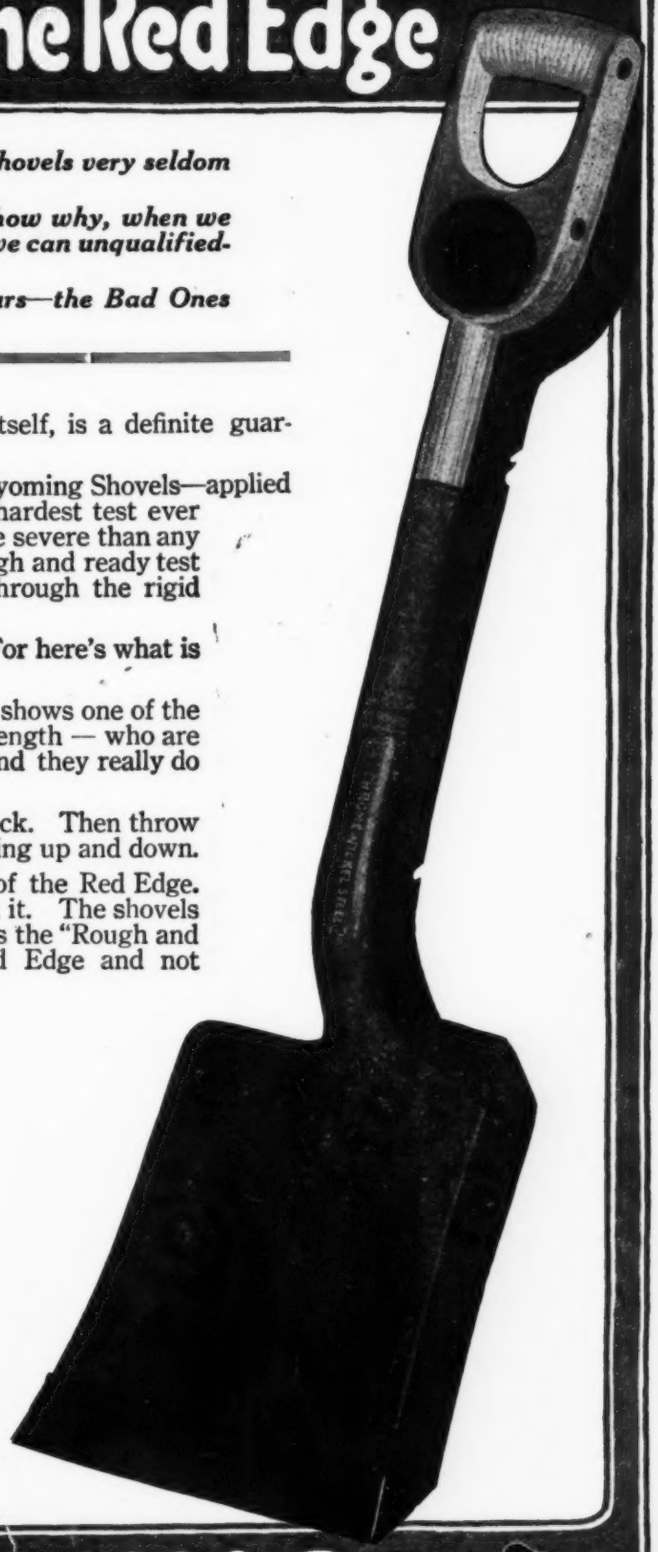
THE COMPLETE MECHANICAL PLANT, LOADER, CONVEYOR, MIXER AND FINISHER

-To Show Why The Red Edge

It is a well known fact that Red Edge Shovels very seldom break, even under the hardest usage.

This is a glimpse behind the scenes to show why, when we put the RED EDGE on Wyoming Shovels, we can unqualifiedly stand back of them.

For always—"The Good Ones are Yours—the Bad Ones are Ours."



THE RED EDGE on Wyoming Shovels, in itself, is a definite guarantee of satisfactory service and long life.

For it is the last step in the making of Wyoming Shovels—applied only after the shovel has passed 100% the hardest test ever devised to prove a shovel. This test is, by far, more severe than any usage you can ever give a shovel. It's the final rough and ready test to catch any shovels which may have sneaked through the rigid inspections while in process.

No faulty shovel can possibly "get by" here. For here's what is done to it:

Mark, if you please, the picture at the left. It shows one of the three huskies — selected particularly for their strength — who are kept busy trying to break Wyoming Shovels. And they really do try to break them.

They place each shovel firmly in the testing block. Then throw all their weight and strength on the handle—springing up and down.

Any shovel which can stand this is worthy of the Red Edge. And only those which pass with flying colors get it. The shovels come to the testing room all black — after they pass the "Rough and Ready Test"— 100% — they then receive the Red Edge and not until then.

This glimpse behind the scenes explains why Red Edge Shovels stand up in Service.

The Red Edge is not only a valuable trade mark for us — it is a valuable protection for you.

The Wyoming Shovel Works
Wyoming, Pa.

New York
165 Broadway

Chicago
347 Peoples Gas Bldg.

Boston
118 Pearl Street

Philadelphia
1234 Commercial Trust Bldg.

Atlanta
1405 Candler Bldg.

Spokane
336 First Avenue

San Francisco
268 Market Street

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The WYOMING SHOVEL WORKS

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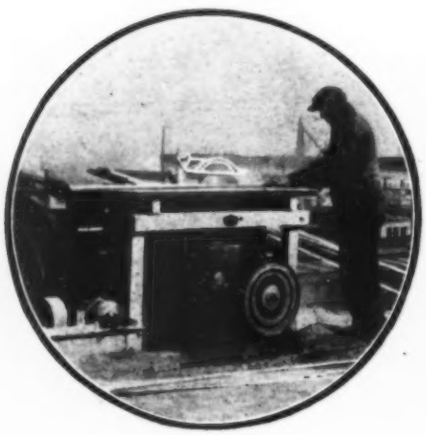
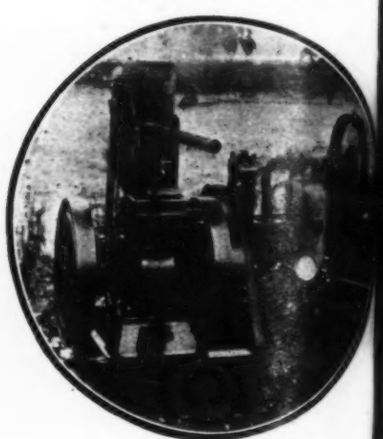
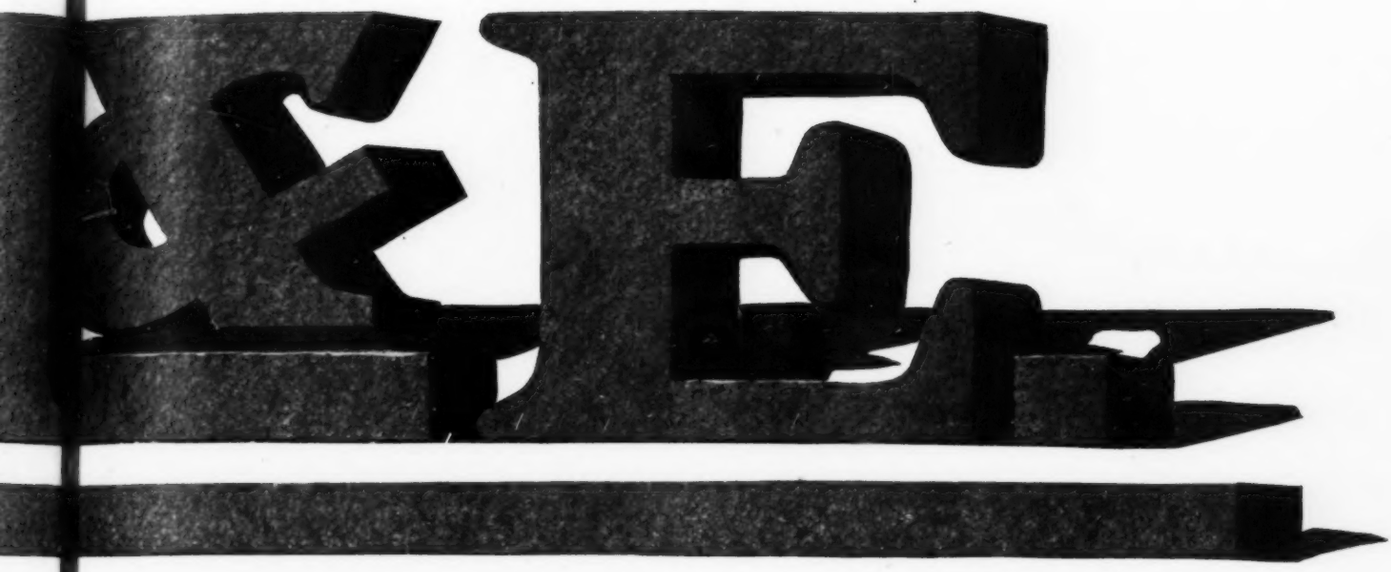
SAW RIGS



BILGE PUMPS

TRIPLEX PUMPS





RTORS' EQUIPMENT

Cut your pay roll and increase the efficiency of your working crew. There's a CH&E way that will short-cut your work on any job and put you on the right side of every bid you make. The trend of the times demands time and labor-saving tools. CH&E Portable Saw Rigs, Power Driven Trench Pumps, Centrifugal, Piston Force and Triplex Pumping Outfits, Builders Hoist, Mortar Mixers and Material Elevators.

Write for our complete catalog

C. H. & E. Manufacturing Co., Inc.
384-A Clinton St. Milwaukee, Wis.

HOISTS

MORTAR MIXERS

SAW RIGS

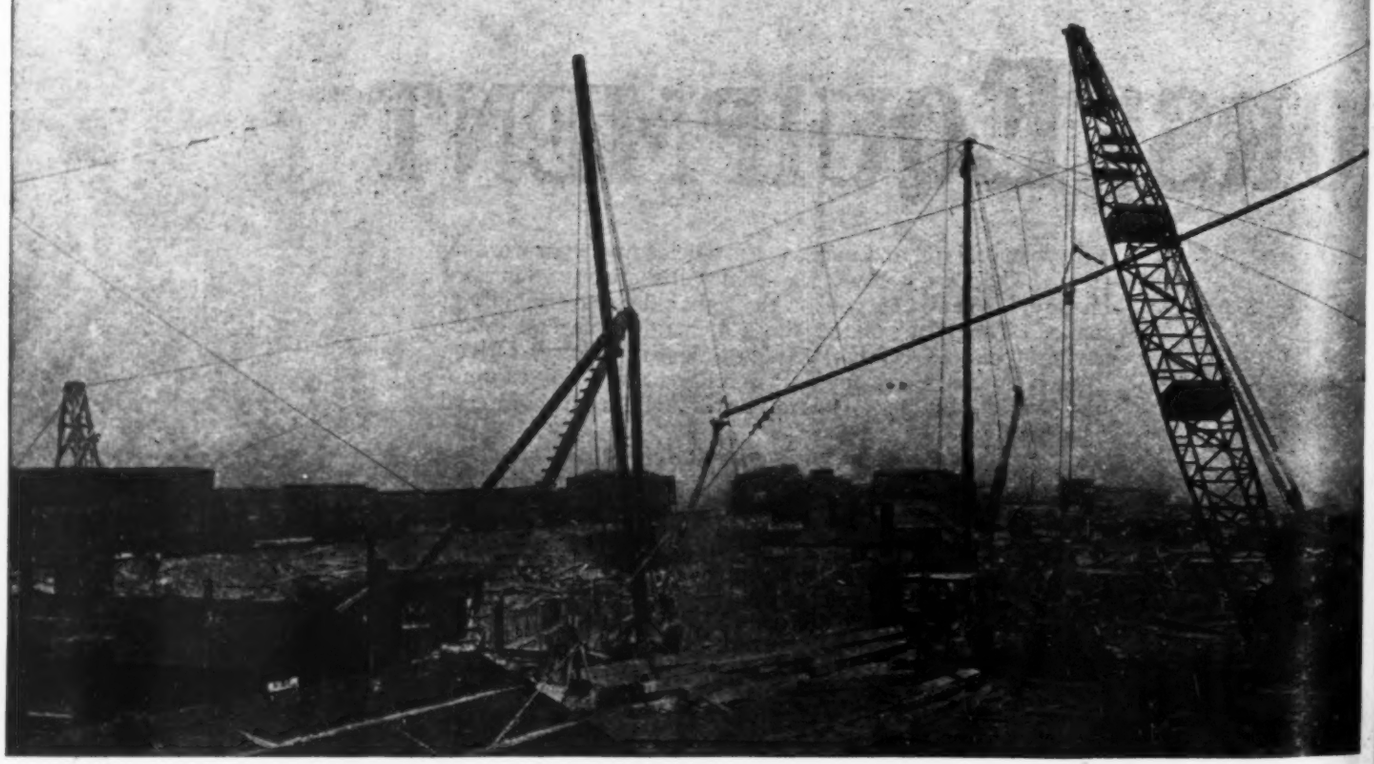
LAKEWOOD BUILT TO LAST

Over 400 Yards a Day

On the West Penn Power Plant at Springdale, Pa., Sanderson & Porter, the contractors, are mixing and placing over 400 yds. of concrete a day. The total volume of concrete is 60,000 cu. yds.

Sand and gravel are delivered by boat and transferred to piles and bins by a ¾-yd. Lakewood Clam Shell, as shown in the insert. Concrete is mixed in a 1-yd. Lakewood Mixer, discharging into a 1-yd. Lakewood Tower Bucket. From the hopper at the top of the 125-ft. tower the concrete is placed by means of a 230-ft. line of Lakewood Chute.

As the work progressed an additional hopper was placed on the tower 60 ft. from the ground, so that the



Lakewood Cons

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LAKEWOOD BUILT TO LAST

More Than Twice As Much Road With Fewer Men When You

Build the LAKEWOOD Way

With the method of concrete road construction developed by Lakewood, machines do the work of men and operation is practically continuous.

Material is transferred by means of a clam shell bucket and crane from freight cars to stock piles, tunnelled the LAKEWOOD Way. Lakewood Road cars, with water-tight cement boxes and separate sand and stone compartments, are filled with complete batches at a central loading plant.

Trains of these cars are hauled over Lakewood Road Track to the mixer. There the complete batches are put into the charging skip by means of the Lakewood Batch Transfer. The Lakewood Road Finisher spreads, compacts and finishes the concrete.

A Few of the Advantages of the LAKEWOOD Way

Large capacity storage plant to insure steady operation. Central loading plant requires minimum labor crew, simplifies accurate measuring of aggregates, and eliminates cost of caring for cement sacks. Hauling over road track eliminates hauling over subgrade with wagons or trucks, thus making refinishing of subgrade unnecessary.

No big wheelbarrow and shovel crews because of the Lakewood Batch Transfer. No stock piles on the subgrade. Clean aggregate assured. Practically no waste of material. Working season practically doubled.

The LAKEWOOD Way is efficient on wide and narrow roads. Because of the great saving in labor and practically continuous operation during an entire season, the LAKEWOOD Way makes possible the construction of more than twice as much road with fewer men.

Have you a copy of Bulletin 29-C?

THE LAKEWOOD ENGINEERING COMPANY
CLEVELAND, U. S. A.

Offices in New York, Boston, Philadelphia, Washington, Pittsburgh, Detroit, Chicago, Milwaukee, Atlanta, Salt Lake City, Los Angeles, Seattle, Kansas City, Oklahoma City, Dallas and San Francisco.

nstruction Plant

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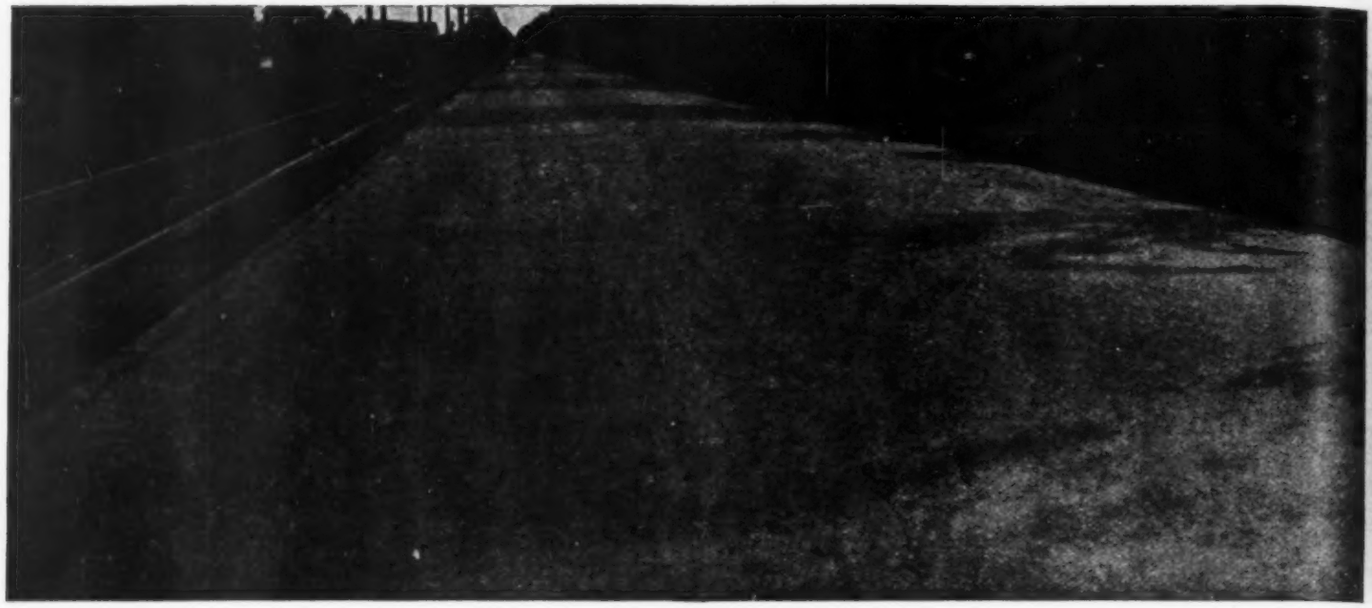

Finished 10 Miles of Road This Year—

This 10-mile stretch of 24-ft. road, with a 6-in. concrete base and a 2-in. asphalt surface, was finished this season by Thos. E. Currie, Contractor, of Detroit. The road is part of that connecting Detroit with Mt. Clemens, Mich.

For one contractor to complete this long stretch of concrete road in one season is out of the ordinary. It would hardly have been possible if Mr. Currie had employed ordinary methods.

But he built the road the LAKEWOOD Way, with fewer men, in less time than usual, and completed the contract in one season.

Had the work been done the OLD way the contract would probably have been split among 3 or 4 contractors. One or more of them might have been unable to finish his part of the contract,

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Lakewood Road Co

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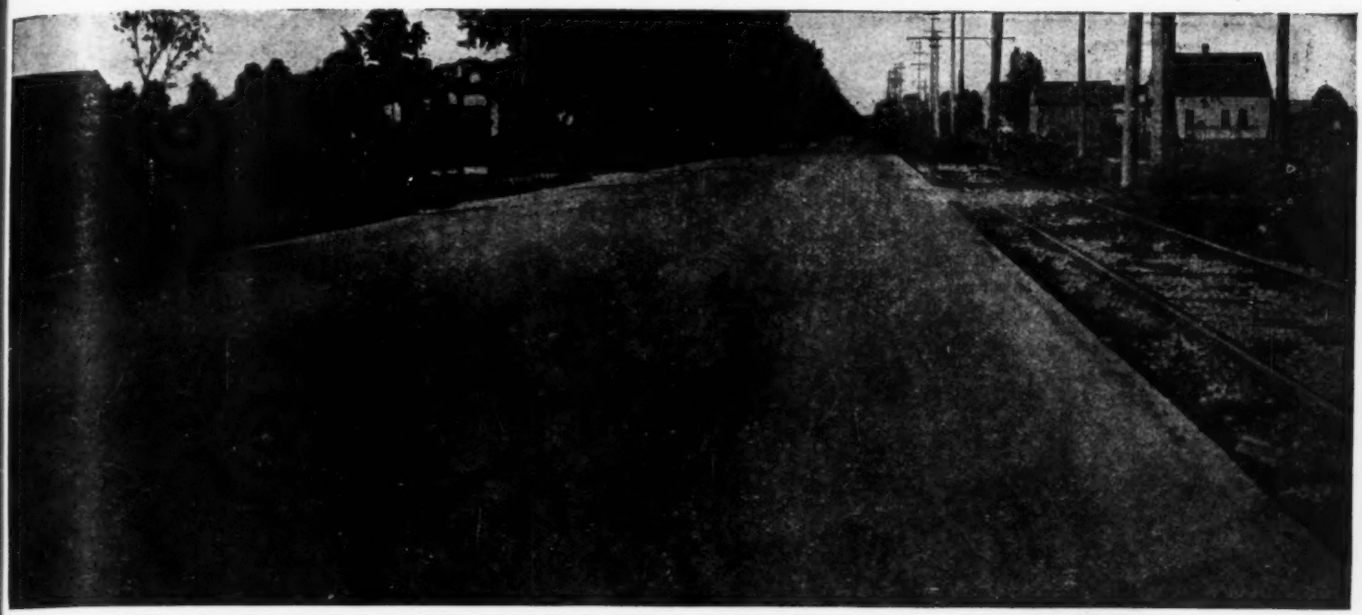

He Used The LAKEWOOD Way

thus causing an incomplete stretch that would have interfered with the efficient use of the whole 10 miles of road.

With the LAKEWOOD Way Mr. Currie's operation was practically independent of weather, the labor crew was comparatively small, costly rehandling was eliminated.

The big daily yardage, and the practically uninterrupted operation possible where the LAKEWOOD Way is used, insure the completion of long, continuous road contracts in one season by one contractor.

The country's road building problem will be solved when each contractor completes longer stretches of road each season. How the LAKEWOOD Way makes possible the building of more than twice as much road each season with fewer men than when using the old way is shown on the next two pages.

THE LAKEWOOD ENGINEERING COMPANY
CLEVELAND, U. S. A.

nstruction Plant

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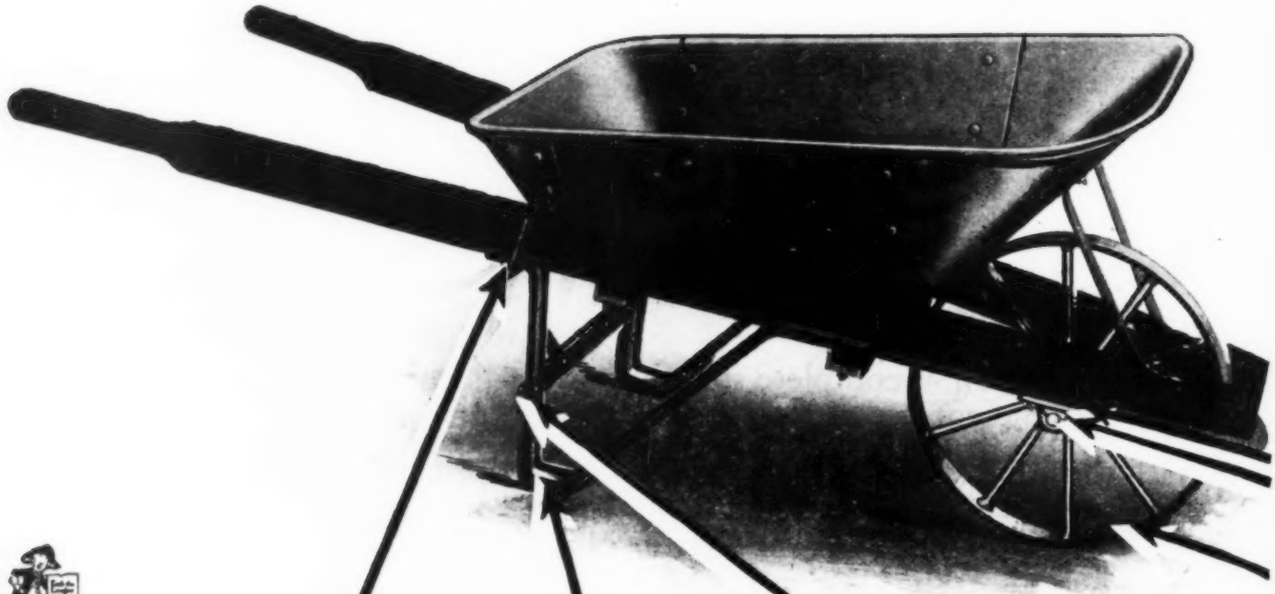
Sterling STERLING ON A WHEELBARROW MEANS

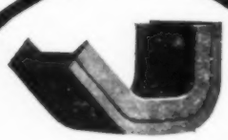
Extra Strength In Every Part

Mark These Six Big Features



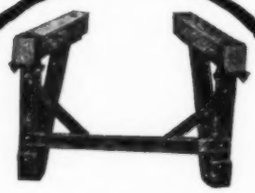
Handles Clamped On

No bolt holes in the handles to weaken them. Here's added strength at the point of greatest strain. Sterling construction again.



This Broad Flat Leg Bearing With Extra Steel Shoe

Heavy Channel Iron Construction. Lasts indefinitely. Never wears through as do usual pointed legs.



Rivets vs. Stove Bolts

Sterling Riveted leg construction cannot work loose. Stove bolts on ordinary wheelbarrows a constant source of trouble.

Sterling Wheelbarrow Company

NEW YORK BOSTON CLEVELAND

MILWAUKEE, WIS.

DETROIT CHICAGO ST. LOUIS

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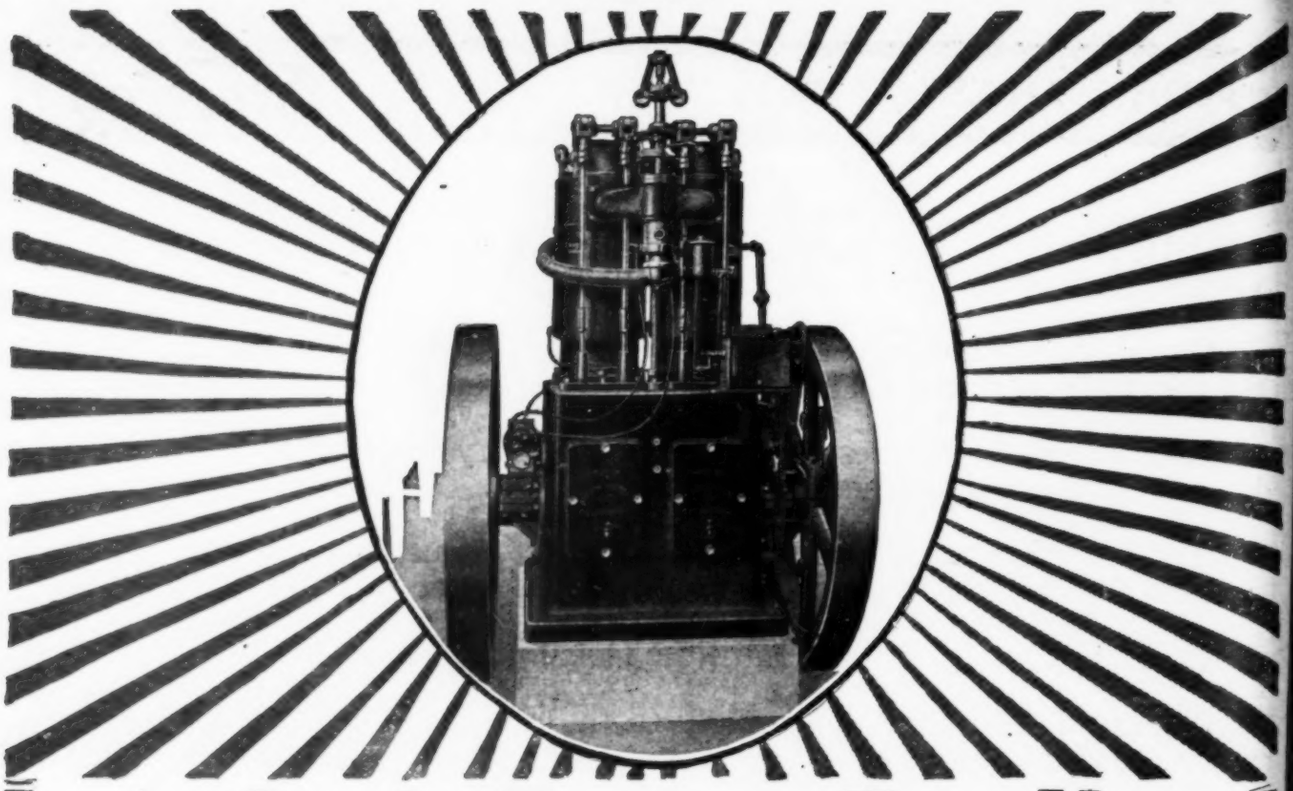

A Cook Engine For You

Some Reasons Why

ENGINE USERS—whether you buy the engine itself, or the machine it runs—mark these facts. They're but a few of the reasons for Cook Engines—only a few of the points which give it supremacy.

For one thing it is one engine you can absolutely rely upon to give reliable, continuous service; to operate at a high degree of efficiency even under the most adverse conditions.

This is because of the remarkable simplicity of design. We have eliminated every unnecessary part and reduced to a minimum the number of cams, gears, etc. All this without impairing the efficiency; in fact, increasing it because of the freedom from trouble.

Every part is accessible without tearing down your engine or removing adjacent parts.

Cook Engines are absolutely dependable—the engine for you.

Sizes from 12 to 40 h.p. in both single and double cylinder types.

Write for detailed specifications and full information.

These Features Assure Cook Performance

Mechanical forcc feed lubrication.
High Tension Magneto with Impulse Starter.
Ball Governor type regulation giving a flexibility heretofore considered impossible in an internal combustion engine.
Hammer forged open hearth steel crank shafts.
Cut Steel Gears.
Genuine Babbitt and Phospor Bronze bearings throughout.
Adjustment feature for all important bearings to take up wear, etc., etc.

The Cook Motor Company, Delaware, Ohio, U. S. A.

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